photomechanical body 24 is not illuminated (shown in broken lines). In a preferred embodiment, the light source 40 comprises a laser 42, and more particularly an Ar-ion laser 43.

The photomechanical actuators 70 of this invention are light driven and do not require electrical power or electrical contacts. It would be highly desirable to integrate the photomechanical actuators 70 of this invention, especially as photomechanical fluidic pumps 80, into micro-electro-mechanical or micro-electro-opto-mechanical systems (MEMS/MEOMS) such as MEMS fuel cells. Two embodiments of the photomechanical actuators 70 are disclosed as photomechanical fluidic pumps 80. Referring now to Figure 8, a photomechanical fluidic pump 80 is shown comprising a fluidic diaphragm pump 86. The fluidic diaphragm pump 86 comprises a fluidic pump chamber 82, an inlet port 83, and a fluid outlet port 84. A bimorphic photomechanical body 24 is shown comprising a fluidic actuator 87 for providing actuating motion to pump the fluid 81 from the fluidic pump chamber ~~83~~ 82 through the fluid outlet port 84. A bimorphic photomechanical sheet 89 comprising a photomechanical polymeric material 30 is disposed adjacent to the fluidic pump chamber 82 and comprises the bimorphic photomechanical body 24. A light source 40 is shown generating a pulsed light output 53 to illuminate an illumination surface 25. The bimorphic photomechanical sheet 89 is adapted to move bimorphically in response to illumination of said illumination surface by said light output, and is shown in an activated deformation, bending away from the fluid 81 in

the fluidic pump chamber 82. This generates a lower pressure in the chamber and draws fluid 81 from the fluid inlet port 83 into the fluidic pump chamber 82. When the illumination of the illumination surface 25 is removed, the bimorphic photomechanical sheet 89 returns to its original dimensions and exerts a compressive force against the fluid 81, thus, raising the pressure in the chamber and forcing the fluid through the fluid outlet port 84. In an alternate embodiment of the invention, the orientation of the bimorphic photomechanical sheet 89 is reversed such that the sheet bends downward into the fluid 81 when activated by the illumination of the illumination surface 25.

Referring now to Figure 9, a photomechanical fluidic pump 80 is shown comprising a fluidic resonance pump 79. The fluidic resonance pump 79 comprises a fluidic pump chamber 82, an inlet port 83, and a fluid outlet port 84. A bimorphic photomechanical body 24 is shown comprising a fluidic actuator 87 for providing actuating motion to pump the fluid 81 from the fluidic pump chamber 82 through the fluid outlet port 84. A bimorphic photomechanical cantilevered beam 88 comprising a photomechanical polymeric material 30 is disposed above a resonance chamber 85 within the fluidic pump chamber 82 and comprises the bimorphic photomechanical body 24. A light source 40 is shown generating a pulsed light output 53 to illuminate at least one illumination surface 25 along the bimorphic photomechanical cantilevered beam 88. The bimorphic photomechanical cantilevered beam 88 is adapted to move bimorphically in response to illumination

of the illumination surfaces 25 by the pulsed light output 53. As the repetition frequency of the pulsed light output 53 is tuned to the proper frequency, the bimorphic photomechanical cantilevered beam 88 reciprocally deforms in a vibration tuned to a harmonic of the resonance chamber 85. These harmonic oscillations produce pressure waves within the fluidic pump chamber ~~83~~ 82 sufficient to draw fluid 81 from the fluid inlet port into the fluidic pump chamber ~~83~~ 82, and then to force fluid 81 from the fluidic pump chamber ~~83~~ 82 into the fluid outlet port 84.

In alternate embodiments of the photomechanical fluidic pumps 80 shown in Figures 8 and 9, the light source 40 comprises a laser 41, specifically an Ar-ion laser adapted to generate said pulsed light output 53. A fiber optic cable 45 is adapted to direct the light output 50 from a light generation device 41 to said illumination surface 25 of the bimorphic photomechanical body 24. An optical system 47 focuses the light output 50. In variations of these embodiments, the bimorphic photomechanical bodies 24 have a plurality of illumination surfaces 25, and the light transfer devices 44 further comprising optic fiber splitters 46 adapted to split light output 50 so as to selectively illuminate the individual illumination surfaces 25. Tunable lasers 41 can be used to vary the pulse repetition pattern, pulse duration, and pulse amplitude so as to control the deformation shape and deformation frequency of either the bimorphic photomechanical cantilevered beam 88 or the bimorphic photomechanical sheet 89, depending on the type of fluidic pump 80. Where the fluid 81 does not significantly absorb or scatter the light

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an optic fiber splitter adapted to split said light output transferred from a light source for transfer to each said non-isotropic photomechanical polymeric material.

62. (currently amended) The apparatus of claim 61, said laser adapted to adjustably generate ~~a~~ said pulsed light output, said pulsed light output having a pulse repetition pattern, a pulse duration, and a pulse amplitude.

63. (original) The apparatus of claim 62, said laser adapted to adjustably generate said pulsed light output so as to vary the pulse repetition pattern.

64. (original) The apparatus of claim 62, said laser adapted to adjustably generate said pulsed light output so as to vary the pulse duration.

65. (original) The apparatus of claim 62, said laser adapted to adjustably generate said pulsed light output so as to vary the pulse amplitude.

66. (original) The apparatus of claim 62, said laser adapted to adjustably generate said pulsed light output so as to vary the time delay between pulses in different light outputs.

67. (original) The apparatus of claim 62, said laser comprising an Ar-ion laser.

68. (original) A photokinetic apparatus for positioning an executing element, the apparatus comprising:

a light source adapted to generate a light output;

a bimorphic polyvinylidene fluoride film exposed to said light output and adapted to move an actuator output arm in response to said light output; and

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said
an actuator output arm connected to said film and adapted to transfer the movement of the output ~~point~~ arm to ~~an~~ said executing element.

69. (original) A photomechanical electronic switch, said photomechanical electronic switch comprising:

an electronic switch disposed in an electrical circuit;

a bimorphic photomechanical body, said bimorphic photomechanical body adapted to operate said electronic switch; and

a light source disposed so as to illuminate said bimorphic photomechanical body; and

wherein, illumination of said bimorphic photomechanical body causes a bimorphic deformation of said photomechanical body sufficient to operate said electronic switch.

70. (original) A photomechanical electronic switch, said photomechanical electronic switch comprising:

a bimorphic photomechanical body comprising a non-isotropic photomechanical polymeric material;

a light source adapted to generate a light output, said light source disposed so as to illuminate said non-isotropic photomechanical polymeric material with said light output; and

an electronic switch disposed in an electrical circuit, said electronic switch comprising: